RESEARCH ARTICLE

OBESITY, CED AND HYPERTENSION AMONG A FISHING COMMUNITY OF MANIPUR, INDIA

[1,*]LaishramIbohal Meitei, [2]SoibamJibonkumar Singh and [1]Ksh. BeliyaLuxmi Devi

[1]Research Scholar Department of Anthropology, Manipur University
[2]Prof. and Head Department of Anthropology, Manipur University

ABSTRACT

The paper reports the prevalence of obesity, CED and hypertension among Meiteis of *Ithing* village, Manipur. Sample consists of 175 normal male individuals' age range from 20 years to 85 years. The average height, weight and BMI of the population are 161.69 cm, 56kg and 21.23 kg/m^2 respectively. The systolic blood pressure of both normotensive and pre-hypertensive comprise a frequency of 82.86 % whereas the hypertension stage 1 and stage 2 show 17.14%. Regarding BMI, about 14% constitute chronic energy deficient individuals but majority of them 76.57% are normal. The overweight and obese individual constitutes 9.14%.

INTRODUCTION

Obesity means having too much body fat. It is not the same as being overweight, which means weighing too much. A person may be overweight from extra muscle, bone, or water, as well as from having too much fat. However, both the terms mean that a person's weight is higher than what is thought to be healthy for his or her height. Overweight and obesity might not be considered as a specific disease, but it is certainly the 'mother' of various degenerative diseases in adult life. Obesity also increases a person's number of years of unhealthy life work disability, hospitalization due to cardiovascular disease and need long-term medication (Sidhu and Kumari, 2006). The issue of overweight and obesity around the world continues to rise and many developing countries face a double burden of over nutrition and under nutrition (WHO/FAO, 2002). As per the World Health Statistics 2012, out of the estimated 57 million global deaths in 2008, 36 million (63%) were due to non-communicable diseases (NCDs). The largest proportion of NCD deaths is caused by cardiovascular diseases (48%).

In terms of attribute able deaths, raised blood pressure is one of the leading behavioural and physiological risk factor to which 13% of global deaths are attributed. Hypertension is reported to be the fourth contributor to premature death in developed countries and the seventh in developing countries (JAPI, 2013). According to Directorate General of Health Services, Ministry of Health and Family Welfare, Government of India, the overall prevalence of hypertension in India by 2020 will be 159.46 persons for every1000 persons. Therefore, it is important from the public health point of view to study the relationship of height and weight (BMI) and blood pressure (Hypertension) in different populations of India. Keeping this in view, the present study aims at investigating the prevalence of overweight, obesity, chronic energy deficiency (CED) and hypertension among the rural adult males of *Ithing* village, a fishing community of Loktak Lake, Manipur (India). *Ithing,* a fishing village located at the bank of Loktak Lake, Manipur, is an irregular hillock village, 48 km. away towards the south of Imphal, the capital of Manipur. The village is under the jurisdiction of Bishnupur district. The average elevation of the village is about 780 metres above Mean Sea Level. The land comprises two natural features namely, the vast lake and small islet on it. In fact, their territory is the vast stretch of water dotted with floats of thick weeds and hyacinth locally called *Phum.*

*Corresponding author: LaishramIbohal Meitei,
Research Scholar Dept., of Anthropology, Manipur University.

The hillocks are the only islet that rises above the water. These are the only dry land where people could establish their settlement. The *Thanga* Road passes through the village. The people who inhabit the village belong to *Loi,* a Scheduled Caste community of Manipur. Though they belonged to *Lois* section, their culture and tradition vary from other *Lois* of *Sekmai, Phayeng, Khurkhul, Andro,* villages of Manipur. The *Lois* of *Ithing* follows almost a similar culture and tradition with the core Meitei population of Manipur. Three of the main seven clans of the Meitei society viz. *Moirang*, *Khuman* and *Ninthouja* are found in this village. They are recognized by their darker skin when compared with the other Meitei in general. Fishing is their primary occupation though agriculture also play important role in their economic life. They practice agriculture in another place located at *Thamnapokpi* village which is at a distance of about 3 km to the southwest from their village.

MATERIALS AND METHODS

The present report is the outcome of the field study conducted during March and April 2010 at *Ithing* village of *Thanga* in Bishnupur district, Manipur. The sample consists of 175 normal male individual age ranging from 20 to 85 years. In order to assess the prevalence of overweight, obesity, chronic energy deficiency (CED) and hypertension; height, weight and blood pressure (BP) measurements were taken on each subjects by using the most accepted standard techniques specified by Weiner and Lourie (1969). The method of BP measurement is based on procedure given by Shaver (1982). The practical and clinical classification of obesity is established on Body Mass Index (BMI). Therefore, the values of BMI were calculated for each subject using the following formula,

$$BMI = Weight\ (Kg)\ /\ Height^2\ (m)$$

The International Classification of adult underweight, overweight and obese according to BMI given by the WHO 2004 were utilized for the assessment of CED, overweight and obesity. For the assessment of hypertension, Blood Pressure Classification given by JNC 7 is followed.

BMI Classification WHO (2004)

Classification	BMI (kg / m^2) Principal cut-off points
Underweight or CED	<18.50
Normal	18.50 – 24.99
Overweight	≥25.00
Obese	≥30.00

BP Classification (JNC 7) 2003

BP Classification (JNC7)	Systolic Blood Pressure mmHg	Diastolic Blood Pressure mmHg
Normal	90–119	60–79
*Prehypertension	120–139	80–89
Stage 1 hypertension	140–159	90–99
Stage 2 hypertension	≥160	≥100

RESULTS AND DISCUSSION

Table 1 presents the age group wise distribution of all subjects according to BMI Classification (WHO 2004).

Out of the 175 adult males, only 25 (14.28 %) are having chronic energy deficiency (CED), i.e. underweight, 134 (76.57 %) are normal and 14 (8 %) are overweight while only 2 (1.14 %) are in obese category. The overweight and obese individual together constitutes 9.14% of the population. Maximum frequency of CED (3.43%) is observed in the age group 50-59 years and 60-69 years on the other hand the age group 30-39 years, 40-49 years and 70 years and above shows the minimum frequency of 3 (1.71%) each. The age groups 20-29 years and 30-39 years have the highest frequency percentage, (19.43 %) of normal individuals followed by 50-59 years (16.17%), 40-49 years (12.57%), 60-69 years (5.14%) and the minimum normal individuals in 70 years and above (3.43%). Concerning the overweight category, the age group 20-29 years and 30-39 years shows the maximum frequency of overweight (2.29%) and there is no overweight individual in the 70 years and above. As regards obese, only the age group 20-29 years and 40-49 years has 1 obese individual in each whereas not a single obese individual is observed in the other groups. While comparing the present findings with the available records of NFHS 3, 2005-06 (Table 2), it is observed that the occurrence of CED or Underweight, overweight and obese among the rural population of Manipur are 15.95%, 10.6% and 1.05 % respectively. Almost similar findings are also provided by the present study i.e. out of the total 175 individuals, 14% constitute chronic energy deficient individuals, 8% comprises overweight and 1.14% accounts for obese individuals. On comparison of prevalence of CED or Underweight, overweight and obese status among the males of entire North-eastern States with the Male Meitei of present study, it is observed that the findings of the present study falls very much within the range as shown by other populations (Table 2).

Besides the North-eastern States, the data on the prevalence of overweight and obesity in various studies (reported by Zargar *et al*., 2000; Mishra *et al*., 2001; Shukla *et al*., 2002; Reddy *et al*., 2002; Sidhu and Sandhu, 2005; Sidhu and Kumari 2006) in India are shown in Table 3. Among the reported studies of rural India, Amritsar rural population has the highest prevalence of overweight and obesity (16.8%), followed by New Delhi, Slum (13.00%), New Delhi, Rural (8.00%), and Manipur, Rural (7.00%). However, the present study shows 9.14 % prevalence of overweight and obesity which is higher than the overall rural level of Manipur and Delhi as reported by NFHS 3, 2005-06. Following the classification of JNC 7 (Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure), 42 (24 %) individuals have normal in systolic blood pressure (Table 4). According to JAPI, 2013, "the prevalence of hypertension increases with age in all population" But such a trend of prevalence is not observed in the present studied population. Maximum number of subjects, 103 i.e. 58.86% belong to Prehypertension category in which the age group 20-29 years and 30-39 years has the maximum frequency percentage of 15.43 % in each and the 70 years and above shows the minimum of 2.29%. Only 28 (16%) and 2 (1.14%) of the total subjects belong to hypertension stage-i and hypertension stage-ii respectively. The age group 30-39 years shows the highest frequency percent (4.57 %) of hypertension stage-i and the minimum of 0.57% in 70 years and above age group.

Table 1. Classification of Adult Males of *Ithing* Village According to WHO (2004) Criteria of BMI

Age group	Underweight		Normal		Overweight		Obese		Total	
	f	%	f	%	f	%	f	%	f	%
20-29	4	2.29	34	19.43	4	2.29	1	0.57	43	24.57
30-39	3	1.71	34	19.43	4	2.29	0	0	41	23.43
40-49	3	1.71	22	12.57	2	1.14	1	0.57	28	16
50-59	6	3.43	29	16.57	2	1.14	0	0	37	21.14
60-69	6	3.43	9	5.14	2	1.14	0	0	17	9.71
70	3	1.71	6	3.43	0	0	0	0	9	5.14
Total	25	14.28	134	76.57	14	8	2	1.14	175	100

Table 2. Comparison of BMI Status of different Populations of North-Eastern States

States	Area	<18.5 (underweight) %	≥25.0 (overweight or obese) %	≥ 30.0 (obese) %	References
Manipur	Urban	14.9	14.8	1.5	
	Rural	17.0	6.4	0.6	
	Combined	15.95	10.6	1.05	
Assam	Urban	32.1	10.9	0.5	
	Rural	36.5	3.4	0.4	
	Combined	34.3	7.15	0.45	
Arunachal Pradesh	Urban	18.0	7.3	0.0	
	Rural	14.2	7.1	0.0	
	Combined	16.1	7.2	0	
Meghalaya	Urban	16.9	5.0	0.4	
	Rural	13.1	6.3	0.3	NFHS-3, 2005–2006
	Combined	15	5.65	0.35	
Mizoram	Urban	8.4	15.6	0.9	
	Rural	10.1	6.5	0.0	
	Combined	9.25	11.05	0.45	
Nagaland	Urban	15.8	10.8	1.1	
	Rural	13.5	3.4	0.2	
	Combined	14.65	7.1	0.65	
Sikkim	Urban	8.8	17.3	1.4	
	Rural	13.1	10.4	1.1	
	Combined	10.95	13.85	1.25	
Tripura	Urban	39.0	12.3	--	
	Rural	42.2	3.3	--	
	Combined	40.6	7.8	--	
Ithing	Rural (Manipur)	14	8	1.14	Present Study

Table 3. Prevalence Rate of Overweight and Obesity in India

References	Place	Area	Obesity criteria of BMI	% age prevalence of overweight and obesity
Zargar *et al.* (2000)	Kashmir Valley	Combined	≥ 27	7.0
Mishra *et al.* (2001)	New Delhi	Slum	≥ 25	13.0
Shukla *et al.* (2002)	Mumbai		≥25	19.0
Reddy *et al.* (2002)	New Delhi	Urban	≥ 25	35.0
		Rural		8.0
Sidhu and Sandhu (2005)	Amritsar	Urban	≥23	51.5
Sidhu and Kumari (2006)	Amritsar	Urban	≥ 25	32.6
		Rural		16.8
		Urban	≥ 23	55.8
		Rural		36.4
NFHS 3, (2005-06)	Manipur	Urban	≥ 25	16.3
		Rural		7.00
Present Study (2010)	*Ithing* (Manipur)	Rural	≥ 25	9.14

The prevalence pattern of hypertension in the present studied population is deviated from the general pattern as stated by JAPI. The reason for the maximum prevalence of hypertension in lower age group 30-39 may probably be due to their dietary habit like excess dietary sodium intake; inadequate intake of fruits, vegetables, and excess alcohol intake.

The individuals of this age group being actively involved in fishing activity, they used to consume fish along with salt throughout the year. On the whole normotensive and pre-hypertensive comprises 82.86% of the population while the remaining 17.14% of the population have hypertension (Table 4).

Table 4. Distribution of Systolic Blood Pressure Status as per JNC 7

Age group	Normal		Prehypertension		Hypertension Stage-I		Hypertension Stage-II		Total	
	f	%	f	%	f	%	f	%	f	%
20-29	10	5.71	27	15.43	6	3.43	0	0	43	24.57
30-39	6	3.43	27	15.43	8	4.57	0	0	41	23.43
40-49	7	4	16	9.14	4	2.29	1	0.57	28	16
50-59	10	5.71	23	13.14	4	2.29	0	0	37	21.14
60-69	5	2.86	6	3.43	5	2.86	1	0.57	17	9.71
70	4	2.29	4	2.29	1	0.57	0	0	9	5.14
Total	42	24	103	58.86	28	16	2	1.14	175	100

Table 5. Distribution of Diastolic Blood Pressure Status as per JNC 7

Age group	Normal		Prehypertension		Hypertension Stage-I		Hypertension Stage-II		Total	
	f	%	f	%	f	%	f	%	f	%
20-29	7	4.00	26	14.86	9	5.14	1	0.57	43	24.57
30-39	8	4.57	18	10.29	12	6.86	3	1.71	41	23.43
40-49	3	1.71	8	4.57	15	8.57	2	1.14	28	16.00
50-59	8	4.57	16	9.14	11	6.29	2	1.14	37	21.14
60-69	7	4.00	3	1.71	4	2.29	3	1.71	17	9.71
70	4	2.29	4	2.29	1	0.57	0	0.00	9	5.14
TOTAL	37	21.14	75	42.86	52	29.71	11	6.29	175	100.00

Table 6. Prevalence of Hypertension in Urban and Rural Indian population

	Year	Place	Age (year)	Sample Size	Prevalence (%)	References
Urban Population	2000	Mumbai	30-60	1662	34.00	
	2004	Mumbai	≥ 35	88653	47.90	
	2005	Delhi	20-59	2935	30.00	
	2006	National	20-69	19973	27.20	
	2007	Chennai	≥ 20	2350	20.00	
	2007	Chennai	18-69	2262	27.20	
	2008	Lucknow	≥ 30	1746	32.20	
Rural Population	2004	Assam	>30	3180	33.30	
	2006	Kerala	>30	2159	36.00	JAPI • FEBRUARY 2013 • VOL. 61
	2008	Haryana	15-64	2159	9.30	
	2009	Maharashtra	≥ 20	1297	7.20	
	2009	Kerala	≥18	1990	36.10	
	2010	Himachal	≥ 18	1092	35.90	
	2010	National	20-69	1983	20.00	
Rural Population	2010	*Ithing* (Manipur)	20-85	175	26.85	PRESENT STUDY

Table 7. Obtained Statistical Constants of Stature, Weight, BMI, SBP and DBP of Meiteis of *Ithing*Village

Age group	Mean Stature (in Kg)	S D Stature (in Kg)	Mean Weight (in Kg)	S D Weight (in Kg)	Mean BMI Kg/m^2	S D BMI Kg/m^2	Mean SBP mm/hg	SD SBP mm/hg	Mean DBP mm/hg	SD DBP mm/hg
20-29	162.61	4.58	57.95	7.33	21.92	2.67	122.79	10.31	80.70	7.37
30-39	162.88	6.07	56.59	8.84	21.29	2.89	124.63	9.78	82.20	9.09
40-49	162.99	5.83	58.21	9.55	21.88	3.17	123.92	13.43	85.36	8.81
50-59	160.14	5.87	53.35	7.69	20.79	2.70	121.90	10.76	81.90	8.45
60-69	158.14	9.72	50.94	8.32	20.36	2.74	124.71	18.41	80.00	14.14
70	161.00	5.92	49.56	4.61	19.08	0.84	118.89	14.52	77.78	12.01
TOTAL	161.69	6.23	55.89	8.51	21.23	2.83	123.2	11.94	81.83	9.35

Age group wise frequency distribution of diastolic blood pressure condition (Table 5) as per JNC 7 reveals that in the whole population normal and prehypertension shares 21.14 % and 42.86 % respectively. On the other hand prevalence of hypertension stage-i and hypertension stage-ii comes to be 29.71 % and 6.29 % respectively. Maximum (4.57%) normal individual lies in each of the age group 30-39 years and 50-59 years while the minimum (1.17%) in 40-49 years. The age group 20-29 years has the highest prevalence of prehypertension of diastolic blood pressure. Regarding hypertension stage i, the age group 40-49years shows the maximum frequency (8.51%) and the age group 30-39 years and 60-69 years constitutes the highest incidence of hypertension stage-ii.

The diastolic blood pressure of both normotensive and pre-hypertensive comprise a frequency of 64.00 % whereas the hypertension stage-i and stage-ii show 36.00% of the whole population. The mean values of systolic and diastolic pressure are observed as 123.2 mm Hg. and 81.83 mm Hg. Respectively (Table 7). As per JNC 7 norms, the prevalence of hypertension stage-i and stage ii for SBP shows 17.14%. But, Journal of The Association of Physicians of India (JAPI) defined Hypertension in adults age 18 years and older as systolic blood pressure (SBP) of 140 mm Hg or greater and/or diastolic blood pressure (DBP) of 90 mm Hg or greater. On following the definition of Hypertension given by JAPI, the incidence rate of Hypertension among the rural male Meitei of *Ithing* village,

Table 8. t values of Stature Weight, BMI and Systolic BP in different age groups

Sample Groups and Sample Sizes					Probability Levels (Theoretical table values)			Calculated t-values			
S_1 Age groups	n_1	S_2 Age groups	n_2	d.f.	0.05	0.01	0.001	t-values Stature	t-values Weight	t-values BMI	t-values SBP
20-29	43	30-39	41	82	1.989	2.637	3.413	-0.001	0.001	0.002	0.001
20-29	43	40-49	28	69	1.995	2.649	3.437	-0.002	0.000	0.000	0.001
20-29	43	50-59	37	78	1.991	2.640	3.420	0.013	0.004	0.004	0.000
20-29	43	60-69	17	58	2.002	2.663	3.466	0.011	0.007	0.007	0.001
20-29	43	≥70	9	50	2.009	2.678	3.496	0.005	0.009	0.014	0.002
30-39	41	40-49	28	67	1.996	2.651	3.442	0.000	-0.002	0.003	0.000
30-39	41	50-59	37	76	1.992	2.642	3.423	0.013	0.003	0.002	0.001
30-39	41	60-69	17	56	2.003	2.667	3.473	0.012	0.007	0.005	0.000
30-39	41	≥70	9	48	2.011	2.682	3.505	0.005	0.009	0.011	0.003
40-49	28	50-59	37	63	1.998	2.656	3.452	0.012	0.005	0.005	0.001
40-49	28	60-69	17	43	2.017	2.695	3.532	0.012	0.012	0.010	0.001
40-49	28	≥70	9	35	2.030	2.724	3.591	0.005	0.015	0.020	0.005
50-59	37	60-69	17	52	2.007	2.674	3.488	0.005	0.003	0.002	0.002
50-59	37	≥70	9	44	2.015	2.692	3.526	-0.002	0.005	0.010	0.002
60-69	17	≥70	9	24	2.064	2.797	3.745	-0.006	0.004	0.015	0.010

Table 9. Karl Pearson's Correlation between Systolic BP and BMI, Systolic BP and Body Weight and Systolic BP and Body Height

Correlation → ↓	Systolic Blood Pressure
Body Mass Index (BMI)	$r_{(SBP and BMI)} = 0.041644$
Body Weight	$r_{(SBP and Body Weight)} = 0.076933$
Body Height	$r_{(SBP and Body Height)} = 0.065953$

Manipur is found to be 26.85 % (Table 6). As per report of JAPI, 2013, the prevalence of hypertension among the national rural and urban population of India are 20% and 27.20% respectively. The prevalence rate of hypertension among the present studied population is higher than the national rural level (20%) but lower than the national urban level (27.20%) Though the prevalence of hypertension of the present population is comparatively higher than the national average, but it is much lower than some other rural populations of Indian States viz. Kerala (36.00), Himachal (35.90) and Assam (33.30). Only two populations viz. Haryana (9.30%) and Maharashtra (7.20%) show lower prevalence as compared to the present population (Table 6).

Table 7displays the age group wise distribution of mean values of Stature, Weight and BMI among the fisherman of *Ithing* village, Manipur. The average value of height, weight, BMI, Systolic Pressure and Diastolic Pressure among them is found to be 161.69 cm, 55.89 kg 21.23 kg/m², 123.2 mm Hg. and 81.83 mm Hg. respectively. Overall mean value of BMI is 21.23 and falls under the normal range BMI.

Table 8 shows both theoretical and calculated *t v*alues of Stature, Weight, BMI and Systolic BP of different age groups. The theoretical value of "*t* " at their respective degree of freedom (df) for each and every *t-test* at the probability level 0.05, 0.01 and 0.001are also given. Thus, it is observed that the theoretical t-values at df 82, 69, 78, 58, 50, 67, 56, 48, 63, 43, 35, 52, 44 and 24 exceeds the theoretical values at all the probability level in all t-test that the difference between the mean height, weight, BMI, and systolic BP of all the two corresponding samples (different age groups) are not statistically significant.

Karl Pearson's Correlation between Systolic BP and BMI, Systolic BP and Body Weight and Systolic BP and Body Height are shown in the Table 9. It is evident that the present data doesn't support the existence of neither positive nor negative correlation between Systolic BP and BMI (r = 0.041644), Systolic BP and Body Weight (r = 0.076933) and Systolic BP and Body Height (r = 0.065953). However, the value of "r SBP and Body Weight", that is the correlation between Systolic BP and Body weight (r = 0.076933) is found to be the highest as compare to the correlation between Systolic BP and BMI (r = 0.041644) and Systolic BP and Body Height (r = 0.065953) indicating that there may be higher positive correlation between Systolic BP and Body Weight as compared to that of Systolic BP and BMI and Systolic BP and Body Height.

Conclusion

The findings of current study reveals that the status of BMI, Systolic and Diastolic blood pressure of the *Ithing* male population shows slight variation in the age group-wise frequency percent distribution. However, there is no statistically significant difference between the mean height weight BMI and systolic BP of all the two corresponding samples (different age groups) as revealed by 't' value. Regarding the prevalence of Hypertension, Chronic Energy Deficiency and Obesity, the findings of the present study are very much within the normal range of distribution. Moreover, when compared with the available records of other populations, no variation is observed. At the same time the present data doesn't support the existence of neither positive nor negative correlation between Systolic BP and BMI, Systolic BP and Body Weight and Systolic BP and Body Height.

REFERENCES

International Institute for Population Sciences (IIPS) and Macro International. 2008. *National Family Health Survey (NFHS-3), India, 2005-06: Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Sikkim and Tripura.* Mumbai: IIPS.

JNC-7 2003.Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. *Hypertension: Journal of the American Heart Association.* 42:1206-1252. http://hyper.ahajournals.org/content/42/6/1206

Mishra, A., Pandey, R.M., Devi, J.R., Sharma, R, Vikram, N.K. and Khana, N. 2001. High Prevalence of Diabetes, Obesity and Dyslipidaemia in Urban Slum Population in Northern India. *Int. J. Obes.,* 25: 1722-1729.

National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular diseases and Stroke (NPCDCS) Operational Guidelines. Directorate General of Health Services, Ministry of Health and Family Welfare, Government of India (ND).

Reddy, K.S., Prabhakaran, D., Shah, P. and Shah, B. 2002. Differences in Body Mass Index and Waist-Hip Ratio in North Indian Rural and Urban Populations. *Obes.Rev.,* 3: 197-202.

Shah, S. N. 2013. Special Issue on Indian Guidelines on Hypertension (I.G.H.)-III. *Journal of the Association of Physicians of India,* Vol. 61.

Shaver, L.G. 1982. *Essentials of Exercise Physiology.* Shurjeet Publication. Delhi.

Shukla, H.C., Gupta, P.C., Mehta, H.C. and Hebert, J.R. 2002. Descriptive Epidemiology of Body Mass Index of an Urban Adult Population in Western India. *J.Epidemiol. Comm. Hlth.,* 56: 876-880.

Sidhu, S. and Kumari, K. 2006. Incidence of Overweight and Obesity Among Urban and Rural Males of Amritsar. *Journal of Exercise Science and Physiotherapy,* Vol. 2: 79-83.

Sidhu, S. and Sandhu, H.K. 2005. Assessment of Overweight and Obesity Among Urban Adult Males of Amritsar (Punjab). *Journal of Exercise Science and Physiotherapy,* Vol. 1, No.1 and 2: 89-91.

Weiner, J.S. and Lourie, J.A. 1969. *Human Biology: A Guide to Field Methods.* IBP Handbook, Number 9. International Biological Programme Blackwell Scientific, Oxford, England.

WHO/FAO 2002. Report of the Joint WHO/FAO Expert Consultations on Diet, Nutrition and the Prevention of Chronic Diseases. World Health Organization, Geneva.

Zargara, A.H., Masoodi, S.R., Laway, B.A., Khan, A.K., Wani, A.I., Bashir, M.I. and Akhtar, S. 2000. Prevalence of Obesity in Adults: An Epidemiological Study from Kashmir Valley of the Indian Subcontinent. *J. Assoc. Phys. India,* 48, 1170-1174.

****